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1972 MARCH 15

**Common Business
Oriented
Language
COBOL**

**Category:
Software
Standard**

**Subcategory:
Programming
Language**

**U.S.
DEPARTMENT
OF
COMMERCE**

National
Bureau
of
Standards

Foreword

The Federal Information Processing Standards Publication Series of the National Bureau of Standards is the official publication relating to standards adopted and promulgated under the provisions of Public Law 89-306, and under Office of Management and Budget Circular A-86. The entire series constitutes the FEDERAL INFORMATION PROCESSING STANDARDS REGISTER.

This series is used to announce Federal Information Processing Standards, and to provide standards information of general interest and an index of relevant standards publications and specifications. Publications that announce adoption of standards provide the necessary policy, administrative, and guidance information for effective standards implementation and use. The technical specifications of the standard are usually attached to the publication; otherwise a source of copies is cited.

Comments covering Federal Information Processing Standards and Publications are welcomed, and should be addressed to the National Bureau of Standards, Center for Computer Sciences and Technology, Office of Information Processing Standards, Washington, D.C. 20234. Such comments will be either considered by NBS or forwarded to the responsible activity as appropriate.

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Abstract

This FIPS PUB announces the adoption of the American National Standard COBOL (X3.23-1968) as the Federal Standard COBOL. The American National Standard defines the elements of the COBOL Programming Language and the rules for their use. The standard is used by implementors as the reference authority in developing compilers and by users for writing programs in COBOL. A primary purpose of the standard is to promote a high degree of interchangeability of programs for use on a variety of automatic data processing systems.

The COBOL language is intended for use with business-oriented applications.

Key words: COBOL; data processing; Federal Information Processing Standard; information interchange; information processing; programming language; software.

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Federal Information
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ANNOUNCING THE STANDARD FOR

COMMON BUSINESS ORIENTED LANGUAGE (COBOL)

Federal Information Processing Standards Publications are issued by the National Bureau of Standards under the direction of the Office of Management and Budget (OMB) in accordance with the provisions of Public Law 89-306 and OMB Circular No. A-86.

Name of Standard. Common Business Oriented Language (COBOL), (FIPS 21).

(1) to achieve the long-recognized advantages that are inherent in the use of higher level languages, and (2) to maximize and protect program investments by making it easier and less expensive to exchange programs among different computer systems, including replacement systems.

Category of Standard. Software Standard, Programming Language.

Explanation. This FIPS PUB announces the adoption of the American National Standard COBOL (X3.23-1968) as the Federal Standard COBOL. The American National Standard (ANS) defines the elements of the COBOL Programming Language and the rules for their use. The standard is used by implementors as the reference authority in developing compilers and by users for writing programs in COBOL. A primary purpose of the standard is to promote a high degree of interchangeability of programs for use on a variety of automatic data processing systems.

The attainment of these objectives, from a Government-wide point of view, depends upon the widespread use of Federal Standard COBOL. Thus, the general intent of this FIPS PUB is to provide for the use of this language in programming all business-oriented applications except in circumstances, discussed below, where such use would not be advantageous.

The COBOL language is intended to be used with business-oriented applications. Other languages, appropriate to other application areas, are being considered for future adoption as Federal Standards.

Applicability. Federal Standard COBOL will be used in programming business-oriented computer applications (i.e., those applications or programs that emphasize the manipulation of characters, files and input/output as contrasted with those concerned primarily with the computation of numeric values) which are developed or acquired for Government use at Government expense. Specifically, the standard will be used for such applications whenever

Approving Authority. Office of Management and Budget.

- the application is being designed and programmed centrally for a decentralized system that employs computers of different makes, models, and configurations.

Maintenance Agency. Department of Commerce, National Bureau of Standards (Center for Computer Sciences and Technology).

Cross Index. American National Standard X3.23-1968, COBOL.

-the program will or might possibly be run on equipment other than that for which the program is initially written.

Objectives. The basic objectives in applying the Federal Standard COBOL Language are

-it is anticipated that the life of the program will be longer than the life of the presently installed equipment.

- the application or program is under constant review for updating of the specifications and changes may result frequently.

- the advantages of the use of this higher level language can accrue locally irrespective of interchange potential (e.g., ease of coding, ease of documentation, improved understanding, and ease of debugging).

3. If the program is to be processed on equipment systems of small capacity for which COBOL compilers are normally not developed.

4. If the program is to be processed on equipment systems that are in the Federal Inventory and for which a standard COBOL compiler is not available.

5. If the computer installation is heavily oriented toward the use of scientific and engineering applications in which case incidental business-oriented applications may be programmed in locally used languages.

Exceptions to the use of Federal Standard COBOL may be made, however, when any of the following circumstances exist:

1. If a comparative analysis shows that the advantages inherent in the use of Standard COBOL are clearly offset by even greater advantages obtainable through use of an alternative language. The language selection should be made in consideration of the Government's overall objectives and should be approved by a central authority in the agency under a waiver procedure, except for the selection of the special kinds of languages identified in paragraph 2 below.

2. If the use of report generators, file management languages, and text processing languages are clearly more economical and efficient. Decisions to utilize these languages do not necessarily require an agency waiver but must be made with consideration of the Government-wide objectives stated above.

Federal agencies should give special attention to insuring that programs for business-oriented applications that will or are likely to be used by organizations outside the Federal Government (i.e., State and local governments and others) are written and made available in Federal Standard COBOL, in order to provide maximum interchangeability in their use.

Specifications. Federal Standard COBOL consists of four alternative combinations of the modules specified by the American National Standard COBOL (X3.23-1968). These combinations are known as Low, Low-Intermediate, High-Intermediate and High Level Federal Standard COBOL, respectively. Each level is defined as consisting of the high or low level nucleus and selected levels of six of the seven Functional Processing Modules (FPMs) of the American National Standard COBOL as follows:

	Low Level	Low-Intermediate Level	High-Intermediate Level	High Level
Nucleus.....	Low(1)	High (2)	High (2)	High (2)
<i>FPM</i>				
Table Handling.....	Low (3)	Intermediate (4)	Intermediate (4)	High (5)
Sequential Access.....	Low (6)	High (7)	High (7)	High (7)
Random Access.....	-	High (9)	High (9)	High (9)
Sort.....	-	-	Low (10)	High (11)
Segmentation.....	-	Low (14)	Low (14)	High (15)
Library.....	-	Low (16)	Low (16)	High (17)

The numbers in parentheses in the above table refer to chapters in X3.23-1968, and a dash in the table denotes that the corresponding FPM is to be omitted.

Implementation. Implementation considerations are divided into acquisition of COBOL compilers and use of COBOL in applications programs.

a. Acquisition of COBOL Compilers. Beginning July 1, 1972, all COBOL compilers brought into the Federal Inventory must be identified as implementing one of the levels of the Federal Standard COBOL (See *Specifications* above). This applies to compilers developed in-house, compilers acquired as part of an ADP system procurement and compilers acquired by separate procurement. This does not apply to orders placed before the date of this FIPS PUB for compilers to be delivered subsequent to the implementation date. Each compiler must include *all* of the language elements of the identified level, except that a compiler acquired exclusively to produce object programs for computers without random access devices need not include the random access module regardless of level.

A compiler may include language elements over and above those of the requested level (whether or not they are part of the Federal COBOL Standard) but such additions will not be specified for development or acquisition unless an agency waiver is first obtained. Waivers authorizing such compilers must stipulate that the additional elements, when used, will be automatically identified and flagged (annotated) on the source program listing by the compiling system (i.e., compiler or preprocessor). It is expected that waivers of this' nature will be granted only upon a clear demonstration that an appreciable and continuing performance vs. cost advantage, when considered from a Government-wide point of view, would be obtained by the use of such a compiler.

At the present time, agencies acquiring COBOL compilers have the responsibility for insuring vendor compliance with Federal Standard COBOL levels. It is expected that a

centralized validation service will soon be available to assist agencies in the area of COBOL compilers. Pending final resolution of this service, agencies should contact the National Bureau of Standards, Office of Information Processing Standards, if assistance is desired.

b. Use of COBOL. Federal Standard COBOL will be used for new applications and applications undergoing major revisions, as soon as compilers that conform to the standard specifications are available and acquired. It is not intended that existing programs be rewritten solely for the purpose of conforming to the standard. This includes programs designed for compilers ordered prior to the implementation date of this FIPS PUB for delivery subsequent to that date.

Programs written in standard COBOL should, to the extent practicable, be limited to the elements of one of the specified levels. Although the use of flagged unilateral extensions in applications programs is permitted, it should be recognized that this practice will compromise interchangeability or may complicate future conversion to replacement computers. Extensions should be employed, therefore, only when their use will result in efficiencies that clearly outweigh the difficulties that they may cause.

Waivers. Agencies are permitted to waive the requirements of this FIPS PUB regarding the use of the Federal Standard COBOL and compliance with the COBOL compiler specifications upon proper internal justification. These waivers need not be coordinated in advance with NBS. However, in order that NBS may be knowledgeable about the extent to which agencies find it necessary to deviate from the specifications of this standard in meeting their operational requirements, agencies are requested to provide NBS with the following information on each of the waivers:

a. Waivers granted in the acquisition of compilers will be reported to the National Bureau of Standards with the following information:

1. Relevant documentation considered by the head of the agency (or his assignee) in authorizing the waiver.
2. Detailed technical specifications of the language deviations granted. In the case of deletions (except as noted under "Implementation 'a' "), exact reference to the items in ANS X3.23 is all that is required.
3. Related to the waiver, a statement of any recommended action that NBS should take concerning future development of COBOL.

b. Waivers involving the *use* of languages other than Federal Standard COBOL, need not be furnished to the National Bureau of Standards. It is requested, however, that the National Bureau of Standards be informed of each occurrence of a major deviation in the use of Federal Standard COBOL in new source programs together with the reasons therefore.

c. Letters should be addressed to the Associate Director for ADP Standards, Center for Computer Sciences and Technology, National Bureau of Standards, Washington, D.C. 20234.

Special Information.

a. Development and maintenance of the COBOL language is the responsibility of the Conference on Data Systems Languages (CODASYL), a voluntary organization comprised of interested organizations. Standardization of COBOL in the United States is in the purview of the American National Standards Institute (ANSI). The technical specifications of American National Standard COBOL, herein adopted as a Federal Standard, are based on the specifications contained in CODASYL COBOL, Edition 1965, as modified by CODASYL through January 1, 1967. The COBOL language is under continual review by the CODASYL organization for

modification and extension. These changes are then reviewed by ANSI for incorporation in revised editions of ANS COBOL.

b. A serious problem that has confronted Federal data processing managers is the often difficult conversion of programs when replacing or upgrading installed computers. Since this involves, in a sense, interchange of programs between computers, then the advantages of using a higher level language apply, even if all that is available is a COBOL compiler that pre-dates the standard. Therefore, in the event such a nonstandard compiler is available, and there are no prospects for the development of a standard COBOL compiler for the machine being used (because it is out of production), serious consideration should be given to the advantages of using the existing (nonstandard) COBOL language for new or revised applications to ease the eventual conversion to a new system employing a standard COBOL compiler.

Where to Obtain Copies of the Specifications of the Standard.

a. Federal government activities should obtain copies from established sources within each agency. When there is no established source, purchase orders should be submitted to the General Services Administration, Specifications Activity, Printed Materials Supply Division, Building 197, Washington Navy Yard Annex, Washington, D.C. 20407. Refer to Federal Information Processing Standard Number 21 (FIPS PUB 21). Price, \$3.05 a copy (includes FIPS PUB).

b. Others may obtain copies from the American National Standards Institute, Inc., 1430 Broadway, New York, New York 10018. Refer to American National Standard X3.23-1968, Standard for Common Business Oriented Language (COBOL). (Price, \$6.50 a copy. Discounts available on quantity orders. See ANSI Catalog.)